

# Heel Height: The Deciding Factor

10-13-05 Pete Ramey Copyright 2005

The “barefoot movement” has come far. Competent trimmers all over the world have made chronic founder and navicular rehabilitation routine business, and more and more farriers and veterinarians are taking notice and thankfully following their lead. It is amazing that our hoof clinics are receiving such overwhelming interest and even more amazing that they are no longer filled with frustrated horse owners looking to the “fringe” for help for their foundered horses. These days, the majority of our clinic attendees are veterinarians, farriers and professional trimmers. This is great news for horses, and I want to acknowledge and thank all of the professional “barefoot trimmers” in the trenches that have studied and worked so hard in the face of constant controversy. Their dedication has created enough success stories to bring the remarkable healing powers of the barefoot horse into the mainstream. It is getting more difficult to find a veterinarian who considers a 20 degree coffin bone rotation “hopeless” and almost as hard to find a farrier who would raise its heels.



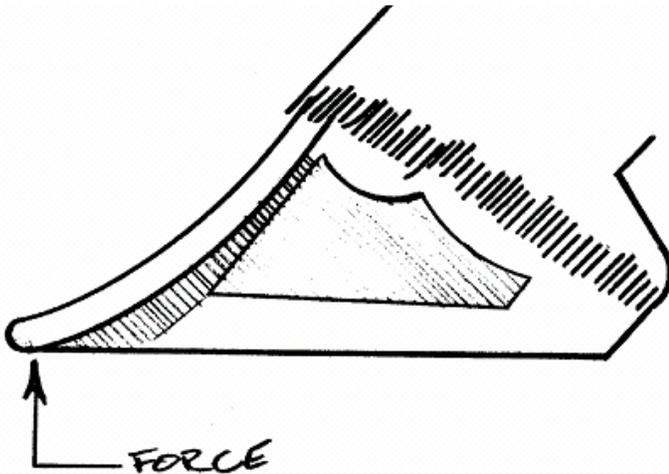
Worldwide, with many notable exceptions, we are falling a bit short in one key area, though. PERFORMANCE!!! The mechanics and theory most experienced trimmers apply work well for rehabilitating the hard cases, but then fails to carry the horse the rest of the way to the “rock crushing high performance hoof” we know every horse **should** grow. Many otherwise successful trimmers fall short at taking hooves to the highest levels of soundness and performance. Fortunately, this is usually a pretty easy problem to fix, so if this is sounding familiar; I can probably

help you here. Of course conditioning is always a small part of it, but it seems that every new thing we learn about trimming makes the actual conditioning seem less and less important.

So let's start by visualizing the hoof at the most common “wall” people seem to hit. A well connected hoof capsule has been grown, but there is always just a bit of white line separation and a little flaring that must be addressed at every trim. The heels have uncontracted for the most part, but could be better, and there always seems to be a little bit of thrush around the frog. The owner is happy that the splits and chips are gone, and the horse performs better than it ever has on easy footing. The problem is that it still can't comfortably negotiate harsh terrain. After trimming, waiting, conditioning, waiting..... we've hit a wall, and after remarkable improvement at first, things haven't improved in quite some time. That “next level” is just out of reach.

Before we get into the trimming, don't forget the boots! Since I started **requiring** that customers buy boots when I pull shoes, no one has questioned it. Horse owners assume their hooves need protection, but then **we** come along and convince them they don't! We have the necessary tools to pull shoes and consistently allow the owner to continue right on with what they were doing with their horse. Why not use them? The added movement stimulates growth and dramatically speeds up everything we are trying to accomplish in growing a healthier hoof, anyway. Adding dense foam insoles to the boots to provide frog stimulation accelerates the process tenfold. (Please read the how-to article “Boots and Pads on www.hoofrehab.com ) Most of the time, in about four to six months, I'm buying the used boots back from my satisfied customers for resale to someone else. That's about the time I used to sheepishly **start** talking about boots in the past. This way is much better!!! Using hoof boots is not a “failure”. If the horse has been continually shod, they are a critical stepping stone to quickly achieving a truly healthy hoof. (I've helped Easycare develop “the right” foam boot insole you can order from them.)

Okay, back to the trimming. First, you have to understand where the pain from walking over rocks is coming from. If you are not cutting the sole of the horse (aside from scratching away loose “dead stuff”) and if your horse is not suffering from acute laminitis or sub-solar abscessing, the sole is very unlikely to be the source of any sensitivity at all. It is mechanically set up very well by nature to bear the weight of the horse. The old worries about sole bruising and corium crushing if the sole touches the ground are myths! They were the product of unhealthy hooves and routine sole trimming. When farriers and trimmers routinely cut the sole they do create an inadequate barrier that will be damaged by ground contact, but this is not nature's plan.



With any amount of wall flare, however, you cannot expect a horse to be comfortable on rocks! When a flared wall meets one rock, all of the horse's weight works on that spot to tear the laminae a bit higher. FLARE HURTS!!! We can't be wimpy about relieving the pressure and lever forces on flared walls, or we will just chase our tails.

That said, the most common cause of hoof sensitivity and the biggest crux we face, actually lies in the back of the foot. The wild horses show us that the hoof should have an arch from front to back, like the arch of your foot and that the heel bulbs/frogs and heels should bear the initial impact force together, with a low heel that doesn't lift the frog off the ground. The coffin bone should shape the front half of the foot, thus the front half of that natural arch so the healthy hoof at rest should have a palmar angle of 3-5 degrees relative to the ground, with the back of P3 being slightly elevated. (Or it should be parallel to whatever the angle the solar surface of the front half of the foot may naturally be.) On hard impact, this arch compresses flat and the back of the foot should be loaded first, giving us **a ground parallel impact** force to P3. **The "soundness problems" some barefoot trimmers face lie in the placing of more emphasis to the hoof mechanics of the horse standing on concrete, than to the mechanics of the hoof in motion..... The mechanics of impact are by far the most significant.**



Dr. Robert Bowker's (Michigan State University) research reveals that traditionally managed domestic horses consistently fail to fully develop the back of the foot. The digital cushion is a very important nerve center hidden beneath the frog. When a foal is born, the digital cushion is comprised of fatty tissues, offering the right amount of protection to the nerves, for the impact force generated by the weight of a foal. The nerves are "exposed" enough to provide "feel", yet protected enough not to register pain on rocky terrain. Every step the wild foal makes causes a bit of growth of dense fibrocartilage to spread through the digital cushion. It starts its journey at the front, just beneath the apex of the frog and gradually spreads towards the heel bulbs. By the time a wild horse reaches adult weight, the digital cushion has been transformed into a tough, dense mass of fibrocartilage. (The same process can happen for domestic horses under natural hoof care, with freedom to move.) The picture below left shows the fully developed digital cushion of a wild horse cadaver. The below right photo shows the incomplete development so common in domestication (Among other problems!). You can see the fibrocartilages starting to spread back and then end halfway through the digital cushion.



At the same time, this movement, hoof expansion and flexion has been at work stimulating and completing the development of the lateral cartilages. The lateral cartilages have grown from 1/8 inch thick to a full inch thick (in the lower part where you cannot see them above the hairline.), and a “floor” of cartilage has also developed between the frog’s corium and the digital cushion. This completed development of strong but flexible cartilage provides a very solid foundation for the back half of the foot. The end result is a very stable but yielding, shock absorbing “back half” of the foot. The “nerve center” in the digital cushion is well protected; nestled within the denser digital cushion and encased within the mass of thick lateral cartilage. This healthy arrangement protects the nerves from “overstimulation” and sensitivity, under the impact force of an **adult** horse.

A lack of frog stimulation and hoof distortion from birth throughout our domestic horses’ lives cause this process to be much slower or nonexistent. Often a 1200 pound adult domestic foot has inner structures of digital cushion and cartilage that are suitable to offer the protection to the nerves that are normal for a 200 pound foal. Many of our horses’ hooves have grown to adult size, but still have the 1/8 inch thick immature lateral cartilages, little or no “floor” of cartilage, and a digital cushion comprised of weakly constructed fatty tissue.

What does this mean? Most of our frogs are incapable of being the “landing zone” nature intended. (Many horses’ heels remain high heeled and contracted as a pure defense mechanism to limit the pressure on the underdeveloped structures.) How do we fix this? Miles and miles of stimulation to the rear half of the foot. According to Dr. Bowker, this process can begin at any age, but must be done while the horse is barefoot. Frog pressure alone doesn’t cut it. It is **pressure and release**. A fixed shoeing method that provides constant frog pressure counts as only one impact out of thousands the horse needs to complete this development. (The same goes with sole pressure and development as well, by the way). The other important factor to this development of proper structure (specifically the lateral cartilages) is the flexion of the hoof capsule; not just expansion, but distortion front to back and the “twisting” of the hoof capsule on firm, varied terrain.

We were all taught that we have loads of trouble with front feet and little trouble with hinds because 60% of the horse’s weight and all of the rider’s weight is on the front feet. They say, “The front end has the brutal job of support, and the back end “just” pushes the horse along.” This is true only in the standing horse and is completely, utterly, 180 degrees wrong when the horse is moving! The moment the horse moves forward, the lion’s share of weight and energy is transferred to the hind end. Get on your hands and knees and invite a kid to climb on your shoulders and go for a “horsy ride”. You’ll learn something. You can crawl around just as easily supporting yourself with your forefingers as you can with the palms of your hands. Almost all of the weight must transfer to your

back end in order for you to move forward. The same is true of the horse.

Just think of the musculature of the horse. I can pull the front foot of a 2500 pound draft horse up and forward, and hold it in my hands, standing in front of him. There is no way he can pull his foot back and away from me (Unless he just walks away, but he would have to use his hinds for that.). He doesn’t have enough strength in the shoulder to overcome my grip. However, if I hold the hind foot of a 400 pound pony, there is no way I can keep him from extending the hind leg any time he wants to. The pure power back there makes me look pretty meek! That’s because the back end has a tremendous job to do.

When a foal is born, all four feet are the EXACT same (even microscopically according to Dr. Bowker). The dramatically greater work load of the foal’s hind feet allow for much more natural development in the back of the hoof. By the time most domestic horses reach adult weight, they have all the right stuff in the hinds, and incomplete development of the fronts. This, of course, leads to sensitive front feet and is also the ONLY reason the fronts are more susceptible to founder and navicular disease than the hinds. (Aside from improper trimming/shoeing) So in other words, without changing anything in an individual horse’s lifestyle, diet or terrain, the fronts could be just as healthy as the hinds if only there was more frog pressure every day; more work; more stimulation and more hoof flexion. *[Foals raised under routine, competent natural hoof care do consistently develop proper structure of their front feet, though, so a large part of this is simply the tradition of allowing foal hooves to overgrow, lifting the living foot out of function, and to then shoe them before the development of the foot is complete. I should point out here that when the foot is allowed to develop properly and the foals weight hasn’t fallen behind its inner structure development, the result will be frogs that actually protrude longer than the heels; yearning to absorb more energy. Don’t fight this; it’s a good thing! ]*

So if you truly understand that the hinds are driving the horse and carrying most of the weight of the rider, it becomes astonishing that the most “anti-barefoot” blacksmith you can find will readily agree that “most horses can do just fine on any terrain with little or no hoof trimming and no shoes on the hind feet!!!” In four years of shoeing, I only shod about ten pairs of hind feet. All of them were requested by the owner; not by the horse. Since then I have been booting horses for seven years and have fit around ten sets of boots for hind feet, **and it is the hind foot that is the “workhorse” of the horse!** Is this giving you goose bumps, yet?

With all that said, let’s get back to our “successful” barefoot transition that has fallen short of that elusive “next level”. The basic principle of setting P3 up on the natural plane (taught to us by the wild horse) and growing new, healthy stuff around that foundation has served the horse well and the external pathologies

in the horse's past are long gone, but usually the development of the inner structures is still lagging behind. This part takes a while. Most of these horses are sensitive in the back of the foot. Watch the horse striding comfortably on grass, and then across a gravel driveway. When the horse hits the gravel, it shortens stride, rises onto the toes and leans forward trying to keep the back of the foot unloaded with short mincing steps. The rush by many barefoot trimmers to achieve the low heel and natural P3 position relative to the ground in a **standing** horse is causing a very unnatural, almost vertical **impact** force! Read that again if you didn't completely get it. The mechanics of impact are much more important than the mechanics of standing around. As soon as a trimmer realizes this, the success rate suddenly improves dramatically. Always leading to higher performance.

Here's an example to clear this up. We have a horse that is comfortable on soft terrain, but on rocky terrain she "toe walks" and is unsound. The back of the foot is not ready to handle the pressure of rocky terrain. Many trimmers continue to habitually lower the heels to 1/16 inch longer than the sole, trying to achieve a 3-5 degree palmar angle or worse; a ground parallel coffin bone in the standing horse. It is true that the calloused "live" sole accurately shows you where the horse mechanically "wants" the hoof walls, but it sometimes fails to tell you how much pressure the frog can take at a given time. If the inner structures are not yet healthy, overexposure of the frog will cause sensitivity and a toe first landing. This means that the horse may have a 3 degree palmar angle while standing, but impact the ground toe-first with a 30 degree palmar angle! This is "bad mechanics" in anyone's book. The problem has just been given too little thought. It is even more important to understand this if you are worrying about the mechanics of an underrun heel. It is a common mistake to try to push the weight-bearing back so far; so fast, that practitioners (in reality) move the most reward weight-bearing to the toe, by making the heels too sore for the horse to use! If this isn't a "light bulb moment", read it again.

To make matters worse, the toe first landing means that the frog is not being stimulated no matter how much frog pressure it may "look" like the horse should be getting while standing. Thus, you are not making any progress. The situation has no way to improve, so you are spinning your wheels.

Here's how I handle the situation: The biggest help is hoof boots with foam insoles. If the heels are high and contracted, I often add additional foam under the frog. This creates extraordinary relief and stimulation that promotes healing. At the setup trim, I usually trim the frog to natural shape relative to its corium (about 3/4 inch thick), but after that I avoid routine trimming of the frog and allow it to pack into dense callous to offer maximum protection to the weak inner structures. I also leave the heels a little longer than the sole (1/4 inch may be all it takes) and they will usually protect the frog just enough that the horse will extend and land heel first. Assuming the horse doesn't live and work on concrete, the heel sinks into the

terrain and the frog gets a reduced, but effective stimulation. Now, we are actually getting somewhere. We will make progress with the stimulation and development of the inner structures.

So in this situation (with a sensitive back of the foot), I would leave a longer heel. This might create a 7 degree palmar angle while the horse is standing on concrete, but offer enough protection to achieve a ground parallel **impact force** to P3 as the "long heels" sink into the ground. I'll take those mechanics any day, and this is **very** important when you are also trying to grow out wall flares at the same time, as a toe-first landing constantly destroys the wall's attachment. When the horse is on firm, rocky terrain, the sensitive structures beneath the frog are well protected by the higher heel. Again, the 7 degree palmar impact walking along on gravel in this situation isn't exactly natural and will shorten stride to some extent, but is much closer to natural than the 30 degree palmar impact we discussed earlier that resulted from favoring the lower heel. As time goes by, the constant use of the frog causes the development of the inner structures of the front foot to "catch up" with the hinds and you will then be able to lower the heels into "wild horse parameters" without sensitivity (actually, they will almost do it for you when they are ready). Natural movement forges the natural hoof. The top priority of trimming should be comfort, a longer stride and a heel first landing. If you can achieve that, everything else tends to fall in place. On the other hand, if you **cut** a natural hoof shape, and the result is sensitivity, an unnatural, short stride and toe first landing, you will fail to make progress.

To further apply this in the real world, simply read the walls the same way we read the wear on a horseshoe. At maintenance trims we normally lower the walls and bars until they are 1/16 inch longer than the sole before we apply the mustang roll. A barefoot horse that has been loading the foot properly throughout the trim cycle will have the exact same amount of wall to remove at the heel and the toe. If an individual horse has been trying to unload the back of the foot (compensating for sensitivity) there will be more wear in the front half of the foot; more wall to remove at the heels. You will also see a nicely exfoliated, calloused sole toward the front, and powdery dead sole towards the back. When this is happening, automatically leave a longer heel above the sole plane. You can be assured that if the horse isn't loading the back of the foot enough to knock off a little powdery sole beside the bars, or wear down wall standing alone above the sole; it is also not loading the back of the foot enough to improve the situation, achieve hoof mechanism, or load P3 correctly.

Many trimmers argue that the hoof should be trimmed to maximize hoof mechanism and I agree. However if you want hoof mechanism and proper hoof function, you must remember the most essential elements of hoof mechanism: Movement. Impact!

The Thoroughbred hoof below is pictured before a maintenance trim. The wear pattern shows that the toes are maintaining themselves perfectly, but the heels show less wear. The inner

structures are still too weak. This 1/4 inch of extra heel height needs to stay, to allow the horse to use the of the foot in comfort, as the heels sink into the terrain. This comfortable, natural use will greatly increase hoof mechanism, circulation, and continue to develop the back of the foot. All that needs to be done in this trim, is to perhaps shave off 1/8 from the bar height.



In other words, what looks like no frog pressure while standing on concrete, may be wonderful frog pressure in the terrain the horse lives and works on. The flip-side? Frog pressure while standing on concrete may translate to zero frog pressure and destructive toe-first landing where the horse lives and works. The same goes for impact mechanics to P3 and the loading of the laminae. This is the critical “missing link” for many barefoot trimmers for both positive, continuing progress and for current soundness when everything is “not quite healthy yet”.

Be aware also that you **must** have this part in mind to succeed with the natural mustang rolls and bringing flared horses back to the natural breakover point (relative to P3) that I teach in my clinics and in other papers on our website. I have talked to experienced trimmers who have kept doing what they were doing at the heels, but tried to apply a truly accurate (read more aggressive) mustang roll at the toe. The result is horses that are sore after trimming. Not at the toe, where they tried to be more aggressive with wall flare, but at the heels, where nothing has changed. The horses are up on their tiptoes after trimming, bearing all of their weight on the “new insult”.

This boggles people’s minds, but it is actually quite simple. When you bring breakover back, you increase stride length. When the stride is lengthened the horse “extends” more, almost forcing a heel first landing. This is great news unless the horse has weak digital cushions, underdeveloped lateral cartilages, and/or thrushy, thin, sensitive frogs. If the horse has been getting along okay by compensating and only loading the toes, suddenly bringing breakover back can cause the horse to stride out immediately loading the frogs more than he has in years. Two or three hard impacts to the weak structures can occur before the horse

figures out how to compensate again and can be all it takes to make the back of the foot really sore for several days. I stress this everywhere, but old habits die hard. It seems like the more experienced the trimmer is, the harder it is to get this point across. Please, if you experiment with the more aggressive dealing with flares that I teach, also be sure the horse is not bearing more frog pressure than the inner structures are ready for. Read the hoof, and see if there is more wear at the toe. If so, just don’t lower the heels in the same trim that you switch to a more natural breakover.

It is amazing how much this “more passive” approach at the heels actually leads to much shorter, healthier heels, and to deeper solar concavity in the end. This is because the natural movement and impact drives the inner structures to a higher position in the hoof capsule. It is also amazing how the resulting heel first landing will help you grow out flares and white line separation. Why is it that every time the horse teaches me something about hoof care, it is always that I should do **less**? When I stopped lowering heels into healthy sole, the heels got lower than I would have ever dared to cut them and performance and the rehabilitation of problems improved dramatically. When I stopped cutting solar concavity into the soles and bars, the soles became more deeply concaved; the bars healthier and more sound than I ever dreamed of. When I stopped routinely trimming frogs and allowed their callous to get tougher and thicker, I stopped seeing thrush and the performance went up still another notch. This article is still another lesson in which the horse taught me to BACK OFF... This is another step “out” of the hoof that leads to even better performance and quicker healing of hoof problems. It seems the more you trim away, the more energy the horse puts into reacting to the trim with excess growth. When you are willing to back off a bit, the hoof is free to “concentrate” on becoming what it needs to be.

I know this violates the theory and the habits of many of you. I certainly don’t expect you to change everything you are doing just because I said so, but please experiment with this. The results are shocking and they happen quickly, so just try it somewhere and see for yourself. I’ll look forward to reading about your customers blasting the competition all over the world!



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